WASHINGTON
SCIENCE TRENDS

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* A CHALLENGE FROM THE FLEET

Here are some technically pertinent excerpts from a "Challenge to Science" by Vice Admiral J. S. Thach, USN, Commander, Antisubmarine Warfare Force, U. S. Pacific Fleet:

✓ Polaris and ASW -- "The reality of the Polaris missile system, married to the nuclear submarine, makes crystal clear the challenge of the future ASW target. Here I would ask you, what must we do?

✓ ASW Requirements -- "Can you give me the positive, secure and rapid communications we need to control our forces, including the deep, submerged ASW submarines? We have an urgent need for such a capability.

We need computer systems to gather the multitude of ASW clues, analyze them and convert them into a meaningful picture from which intelligent decisions can be made rapidly.

Can you provide scientific means to make our forces invisible to periscope and electronic observations?

Can we conquer the physical limitations of short sound ranges in salt water? Perhaps, more than any single feature, ASW forces will need means to scan large areas of the oceans of the world to know where enemy submarines are lurking.

Can technological and scientific talent provide sonar effectiveness at high speed? Our ASW forces of the future must travel fast to close the swift moving submarines. Hydrofoil applications in ASW are in their infancy. Airborne and surface sonars must keep pace. They must hold the target with precise, position fixing potential.

We need means for keen and quick capability to discern the submarine and we need deceptive means to decoy our target for quick attention and killing blows by long-range weapon systems. Can you tell us how to make the enemy submarine skipper think we are far away when we are actually near, and close to him when we are not there at all? Can you compute the false echoes at long distances in the broad ocean area, so we can classify with instantaneous effectiveness the quiet submarine treading water on station, waiting for the word to fire?

✓ Nuclear Power -- Our naval nuclear needs of tomorrow encompass not only the surface ships -- but our ASW naval air power as well. Seaplanes flown with miniaturized reactors (will) permit an exploitation of the sustained mobility potential provided by the ASW seaplane we want tomorrow - but need today.

Such seaplanes will have the capability to seek submarine contacts throughout the world's oceans, and when the contact is found, their endurance will enable us to stay with the submarine until a thorough investigation is made, or a kill if necessary.... We want this aircraft to fly low and slow."

* U. S. SCIENCE INFORMATION HANDBOOK

The National Science Foundation this week releases a new "desk reference" handbook for scientists and engineers on U. S. science information services. The directory was compiled by Battelle Memorial Institute, Columbus, Ohio for the Foundation, and covers the physical and biological sciences and technology.

Some 427 organizations, including Washington SCIENCE TRENDS, are listed and described in the new directory -- from an original list of some 10,000. The Foundation states "the directory has been designed to be used as a direct reference aid by working scientists and engineers; however it should also prove useful to librarians, documentalists, and others who assist the technical man in locating scientific and technological information."

("Specialized Science Information Services In the United States," Publication NSF 61-68. 528 Pages. $1.75 from Superintendent of Documents, Government Printing Office, Washington 25, D. C.)

* U. S. TO LAUNCH "HAM" SATELLITE

The Air Force hopes to place a small satellite for amateur radio experimentation on board a Discoverer satellite planned for launching from Vandenberg Air Force Base, Calif. during December. The project was fostered by several California "ham" radio operators and is known as Project Oscar (Orbiting Satellite Carrying Amateur Radio).

The ten-pound satellite will contain its own battery power system, and is anticipated to have a 30-day life on orbit. It is designed to investigate radio propagation in the two meter (144-146MC) portion of the radio frequency spectrum. Amateur radio operators around the world, including more than 200,000 licensed U. S. operators, will be invited to participate in the operation, and perhaps contribute to future space communication systems.

* ARMY CONTRACTS FOR "LIFT FAN" DEVELOPMENT

The Army Transportation Corps has awarded a development contract to the General Electric Co. Flight Propulsion Laboratory, Evandale, Ohio, for a flight research program using GE "lift fan" propulsion systems. Ryan Aeronautical Co. is expected to receive a subcontract for construction of the two test airframes. The propulsion system uses two J 85-5 jet engines, a gas diverter valve and a tip turbine-driven fan. For vertical takeoff and landing the jet engine exhausts are directed to the lift fans located in the wing structure. For forward flight transition, vanes direct the air flow partially rearward. For normal flight, the diverter valve is closed, permitting conventional jet propulsion at speeds expected to be in excess of 450 knots.

The $6.9 million initial contract covers the first phase of a two-part program. The resulting test aircraft are expected to be judged in competition with the "Hummingbird" VTOL aircraft being developed by Lockheed Aircraft Corp., Marietta, Ga. (Washington SCIENCE TRENDS, Sept. 11, 1961)

* SUPERSONIC TRANSPORT PROGRAM

Bid proposals will be issued to industry soon for research services in connection with the Mach 3 commercial supersonic transport program. The documents will come from the Aeronautical Systems Division, Air Force Systems Command, Wright Patterson Air Force Base, Ohio. Congress this year appropriated $11 million to the Federal Aviation Agency to get the program underway. Most of this will be spent under contract with industry, with the Air Force acting as the FAA's agent for contract administration and technical support.

* ARMY MEDICAL SERVICE RESEARCH PROBLEMS (Continued from WST, 11/13/61)

□ AMEDS - 10 -- Develop a self-propelled litter. (The AMEDS needs a carrying device which will enable one person to remove a casualty from the battlefield and/or move over difficult terrain. Battlefield conditions do not easily lend themselves to devices which assist in the removal of casualties. Whether in mountains or plains rescue is difficult due to exposure to small arms, motar and artillery fire. Normally the terrain is littered with debris, deep and rain soaked holes, building rubble and the hazards of natural environment common to the mountainous or the jungle areas.

In the future, mobility and greater fire power will widen the area to be defended by the individual soldiers. The result of this dispersement will require more time to search for and remove casualties and increase the requirement for manpower during the most critical period.

In order to assist one individual to attain the capability of removing a casualty a collapsible litter with its own power is needed. It should be easily carried on the back weighing less than 50 lbs. The motor should be of sufficient horsepower to move a 200 lb. man up a rather steep slope and be able to travel about a mile without refueling. The tires should be low pressure, easily inflatable, and self sealing, in order to absorb the shock of ragged projections. The noise of the motor should be kept below conversation level - about 60 lbs. The configuration of the assembled unit should provide a low silhouette and enable the litter to be guided from the crawling or walking position.)

□ AMEDS - 11 -- Develop a preparation that will act as a splint. (The AMEDS requires a means of applying a splint which will enable the medical aid man to immobilize fractures easily and rapidly on the battlefield. There are many satisfactory splints used by the military which are so designed that they readily fulfill the purpose for which they are intended. Those most commonly known are the Half Ring Leg and Arm Splints, the wire ladder splints and the basswood splints. While some of these must be used under specific conditions especially where traction must be applied, the time and effort expended to apply the splint properly some times negates their purpose.

The casualty who has suffered a severe fracture while still exposed to enemy fire must be removed to a safer area immediately. Yet many times the fracture is sufficiently ragged so as to sever major arteries or veins and cause irreversible shock. Under conditions such as these it is desirable to apply appropriate dressings and then use a suitable material or device to immobilize the wounded area until proper care can be given.

Although not limited to the development of such a device, an aerosol dispenser could be easily carried and used to apply a polyethelene material while the aid man lies flat on the ground. Undesirable characteristics such as those that cause the clothing to crease to a knife edge or permit the spaces between clothing and skin to form pockets must be considered in the recommended technique. If the open wound is to be covered the chemical must be non-toxic. Chemical reactions to heat and cold must be minimized to the point where the wound is not affected by distortion caused by temperature expansion or contraction. Combat troops could be exposed to areas with extreme cold and heat (65° to 125°F) and heavy rainfall. When adequate facilities are available for additional medical treatment, the splint must then be easy to remove.)

□ AMEDS - 52 -- Develop an expendable thaw indicator for frozen foods. (There is a requirement for the development of a simple, expendable thaw indicator which can be packaged with frozen foods to indicate if the foodstuffs have ever been thawed during the storage and distribution process. The indicator should be as packaged as to make it readily examined throughout the handling cycle.)

* ARMY MEDICAL SERVICE RESEARCH PROBLEMS (Continued)

- AMEDS - 20 -- Develop a battle casualty marker. (Individuals operating singly in scattered patrols, in jungles, over rugged terrain, and during hours of darkness may easily become casualties without anyone becoming aware of this fact for long periods of time. The present system of calling for help is far from adequate under these circumstances and particularly if the casualty is unconscious.

  There is a requirement for a system capable of automatically detecting the presence and location of a casualty from any cause and of relaying this fact to some control point. The system must be effective under all conditions of terrain, climate, day or night, and over distances of up to one mile. Locations should be pinpointed with accuracy of a few yards without revealing this information to the enemy.

  The device, if carried by the individual, must be small, lightweight, compact, simple and reliable. It must have a manual override which may be turned off by the individual in case of accidental triggering or may be automatically turned off when the location has been detected and registered. The device must be compatible with other field equipment and with other communications systems and must not impede the individual in the performance of his combat mission.)

- AMEDS - 48 -- Develop a simple, accurate methodology of determining toxicological data. (Advancing technology continually introduces new substances into mankind's environment. Increasing concern is evident, not from a standpoint of controling known hazards, but for man's ability to elucidate how chronic exposure to trace quantities may affect his health and equally important, to identify such substances. Present systems of providing qualitative and quantitative data are time consuming, cumbersome, and totally inadequate. There is a requirement for a simple method of identifying toxicological agents and accurately determining their concentrations, even in minute quantities.)

- AMEDS - 49 -- Develop a mobile, field sterile solution plant. (Considerable quantities of sterile water are required in the operation of medical treatment facilities and their shipment to theaters of operations during wartime only adds to an already major logistical problem. The ability to produce these sterile solutions within the theater of operations would materially reduce the logistical burden and would insure a readily available source under all conditions. This could be accomplished by the preparation of dry, sterile components for various intravenous solutions, if the capability to reconstitute the solution in the field were available. There is a requirement for the development of a mobile field, intravenous, pyrogen-free, sterile solution plant.)

- AMEDS - 50 -- Devise a method for the rapid development of X-ray film. (There is a requirement for a method for rapid development of high quality x-ray negatives without the necessity for complicated dark-room procedures. The development of suitable high-quality positive x-ray plates may be an acceptable substitute.)

- AMEDS - 51 -- Develop a rapid means of evacuation possibly without the use of evacuation personnel. (In order to reduce the time from injury to definitive treatment and to reduce the medical workload in forward areas, it is highly desirable that a means be provided for immediate evacuation of the patients from the most forward area to some rear facility. Such a system, perhaps missile transport, should be capable of operations to a distance of at least 200 miles and should not require personnel for other than loading and unloading. Such a system would materially increase the mobility of tactical elements and reduce the logistical support requirements.)

- AMEDS - 60 -- Develop a foreign body locator. (There is a requirement for the development of a means of locating metallic and non-metallic foreign bodies in the human body. High velocity, low mass fragments of the type anticipated in future conflicts will require devices with 3-dimensional display capability for their accurate location.)

* ARMY MEDICAL SERVICE RESEARCH PROBLEMS (Continued)

- AMEDS - 53 -- Develop a direct recording and interpreting EEG and EKG. (The interpretation of tracings on currently used EEG and EKG instruments requires highly trained professional personnel. There is a requirement for the development of miniaturized, direct recording and interpreting diagnostic EEG and EKG machines, thereby reducing the requirement for professionally trained personnel and the time required for the interpretation.)

- AMEDS - 54 -- Devise a simple field test for free available chlorine in water. (The present standard method of testing for free available chlorine, the orthotolidine-arsenite test is complex and is too sensitive to interferences, temperature and time. There is a requirement for the development of a simple field test for free available chlorine in water, devoid of the limitations of the present test procedures.)

- AMEDS - 61 -- Develop a dosimeter that by an accurate and reproducible method would reflect the sum of biological injury resulting from ionizing radiation. (Physical dosimetry is a measure of primary or secondary ionization events and does not reflect the dynamic and complex processes of injury occurring biologically. A biological dosimeter should be responsive as quickly as possible following exposure so as to provide critical information prior to the usually delayed appearances and stabilization of the classical symptoms and signs of the radiation syndrome.)

- AMEDS - 63 -- Develop field equipment capable of determining the amount of chemical contaminants in foodstuffs. (Laboratory determinations of chemical content is a relatively simple process. The possibility of enemy chemical warfare operations makes it highly desirable that equipment be available for field use which will accurately measure the amount of the CW agent present, rather than the present capability of merely detecting its presence in unknown quantities. Such a quantitative determination capability will prevent the condemnation of foodstuffs with subtoxic levels of chemical agents.)

- AMEDS - 66 -- Develop direct reading instruments for industrial hygiene sampling. (Industrial hygienists presently collect atmospheric samples at the operational site, after which they are forwarded to a center for analysis. The results are not known for some time, and the installation may not have the information until much later. A direct reading and/or recording instrument, with an acceptable accuracy would permit more careful and thorough evaluation of any specific problem, including repeated samplings for identification of the source, areas of greatest contamination, etc. There is a requirement for instrumentation for determining the presence of lead, TNT, nitroglycerine, acid and alkali mists, ammonium nitrate, arsenicals, ozone, beryllium and/or cadmium compounds.)

- AMEDS - 74 -- Develop a compact, high and low speed dental drill for use in the field. (A need exists for a dental operating drill that can operate in the field at speeds of from 5000 rpm with high torque to 250,000 rpm with low torque, using standard burs. The unit should be compact, rugged and easy to assemble and disassemble. It must operate from a self-contained energy source and/or standard military batteries and generators.)

- AMEDS - 76 -- Develop a small dental x-ray apparatus using film which can be daylight processed. (A need exists in the field for a small, light weight dental x-ray machine which can be easily transported by one man. The apparatus should be operable from a self-contained energy source and/or standard military batteries and generators to permit its use in areas not accessible to conventional electric power sources. It should be easily assembled and disassembled and either attachable to a standard item of dental equipment or include a satisfactory stand. The apparatus must use dental x-ray film which will permit daylight processing without bulky or elaborate equipment.)

TECHNICAL TRENDS

□ The Navy is replacing laminated plate safety glass windshields for its A3J Vigilante aircraft with a new windshield made of stretched acrylic. The change is expected to save $5,000 per installation, while reducing weight and providing undistorted vision and shatter protection. √√√ Information on an August, 1962 conference on Precision Electromagnetic Measurements is available from J. F. Brockman, National Bureau of Standards, Boulder, Colo. √√√ A list of nine life science research contracts awarded during August, 1961 is available as Announcement IN-269 from the Information Office, U. S. Atomic Energy Commission, Washington 25, D. C. √√√ The Office of Naval Research is planning to contract with the Raytheon Co. for development of a high-power C-band amplitron tube. √√√ Single free copies of "Is There a Future Scientist or Engineer in Your Home?" are available from the Public Services Office, Battelle Memorial Institute, Columbus 1, Ohio. √√√ Northrop Corp's. SD-1 Surveillance Drone is said to have successfully demonstrated tactical applications when a TV camera is installed.

□ Information on a 1962 symposium on current trends in nuclear power, co-sponsored by the Argonne National Laboratory, is available from Prof. Lynn Weaver, Nuclear Engineering Department, University of Arizona, Tucson. √√√ The Atomic Energy Commission has decided not to require special licenses for automobile lock illuminators which use tritium in the form of paint completely sealed in plastic. √√√ Information on special Atomic Energy Commission fellowships for graduates in biology, chemistry, engineering and physics is available from the Health Physics Fellowship Office, Oak Ridge Institute of Nuclear Studies, P. O. Box 117, Oak Ridge, Tenn. √√√ The Research Division of General Dynamics/Electronics at Rochester, N. Y. has won an Army contract for development of an experimental speech compression system called a "formant vocoder" which may make it possible to send about 30 conversations over a telephone circuit that now handles only one. √√√ Agriculture Department researchers have found that a half-dozen derivatives of ethylenimine, a family of relatively simple organic compounds, may be of value in eliminating the common housefly through chemosterilization. Some further details are available in Announcement USDA 3587-61 from the Information Office, U. S. D. A., Washington 25, D. C. √√√ Exports of business machines increased 64.5 percent during the first half of 1961, compared with the same period in 1960. At the same time, imports increased 33.2 percent. Electronic computers and related equipment showed a strong 217 percent export gain. For further statistics, ask the Information Office, BDSA, U. S. Department of Commerce, Washington 25, D. C. for Announcement BD-61-184.

□ The oft-delayed Pratt and Whitney RL-10 liquid hydrogen rocket engine has successfully completed a series of 20 captive firing tests, consistently producing its rated 15,000 pounds of thrust. Two such engines will power the Centaur launch vehicle, scheduled for a first flight test early in 1962. √√√ A site in the Sand Springs Range of Nevada has been tenatively selected for tests of the Vela Uniform seismic research program, aimed at detection and identification of nuclear testing. √√√ The target date for the Project Gnome underground nuclear detonation is now December 10 at a site near Carlsbad, New Mexico. √√√ Information on a December 15, 1961, Washington seminar on current progress in Perceptron data systems is available from Miss Josephine Leno, Code 430A, Office of Naval Research, Washington 25, D. C. √√√ A preliminary report on the potential use of the Perceptron device for detecting targets of military significance from aerial photographs is now available at $1.50 from OTS, U. S. Department of Commerce, Washington 25, D. C. Ask for PB 171 832. √√√ Thiokol Corp., Elkton, Md. will build the main retro rocket engine for the Surveyor Lunar Spacecraft, under a subcontract from Hughes Aircraft Co.

□ AUSTIN CELL FOR POWER CONVERSION: The Air Force has awarded a $75,000 study contract for research on an "accidental" discovery of a possible new power source. The finding, which came about during work on another project, was that "certain metals", separated by a porcelain enamel, produce electric power when heated. In a test, thin plates shaped like slices of bread, were inserted in a household toaster. Enough power to drive a small electric motor and its propeller was produced. Even though removed from the heat source, the plates continued to produce electricity as long as stored heat remained. One possible application for such cells is in rocket nozzles, which could produce power when activitated by the waste heat.

(Development by B. A. Austin, Consultant Engineer, Westinghouse Aerospace Electrical Department, Lima, Ohio, with assistance from Battelle Memorial Institute, Columbus 1, Ohio)

□ NAVY DEVELOPS IMPROVED LEAK TEST: A method for detecting leaks in all items which would be damaged by the conventional "vacuum over water" test method has been developed by the Navy. The method has already been used for production leak testing of several pyrotechnic devices, and the evaluation of at least one fuze. The so-called "air pressure differential" technique does not use water or even specific gases such as freon or helium for operation. Instead, a device under test is placed inside a sealed tank subjected to air pressure. If the test device leaks, air pressure in the tank drops. By knowing the free volumes of both the device and the test tank, the leak rate of the device can be calculated.

(Development by R. A. Simon, Chemical Engineering Division, U. S. Naval Ordnance Laboratory, White Oak, Silver Spring, Md.)

□ ANALOG SIMULATION OF ZONE MELTING: The National Bureau of Standards has developed a simulation technique which can generally be used to avoid poorly-designed zone melting experiments in which costly semipurified metal is often lost. An electronic differential analyzer is used to determine, in advance, the power levels and time constants of the heat transfer process. The simulation technique, which was used with small-diameter tungsten rods, is also said to be applicable to other materials.

(For further details of "Analog Simulation of Zone Melting" write National Bureau of Standards, Office of Technical Information, Washington 25, D. C.)

□ FIRE-RESISTANT HYDRAULIC FLUIDS: The U. S. Bureau of Mines believes that experience has proven the advantages of relatively new fire-resistant hydraulic fluids for use in underground mines. The so-called "water-in-oil" emulsion type fluids are not only safer but are often cheaper and more efficient than flammable-oil fluids, the Bureau states. In addition, the emulsion-type fluids are said to have higher viscosity (which reduces leakage); lighter color (which makes leaks easier to spot) and lower operating temperatures.

(For further details see Information Circular No. 8043. Single copies free from the Publications-Distribution Section, U. S. Bureau of Mines, 4800 Forbes Avenue, Pittsburgh 13, Pa.)

□ INSTANT AIRCRAFT CAMOUFLAGE: The National Cash Register Co. has been developing for the Navy aircraft coatings which, at the will of the pilot, can be reversibly changed from visible to camouflage. Exploratory work included the development of several photochromic "pigments", which are believed to be superior to ordinary dyes. The formulations, which switch from clear to a dark blue, are believed to have the physical characteristics required by the Navy, although short life could limit their use at the present stage of development.

(Details and test reports are contained in Report AD 259 431 available through military channels or for sale in photocopy from OTS, U. S. Department of Commerce, Washington 25, D. C.)

PUBLICATION CHECKLIST

- ☐ TIROS RADIATION EXPERIMENT, a report on the operation and findings of the infrared emission and reflected solar radiation experiments aboard the Tiros II weather satellite. 8 Pages. Single Copies Free. (Write National Aeronautics and Space Administration, ATTN: CODE BID, Washington 25, D. C. for NASA Technical Note D 1152)

- ☐ ELECTRICAL SAFETY, a new handbook on safety rules for the installation and maintenance of electric supply and communications lines. 197 Pages. $1.75. (Write Superintendent of Documents, Government Printing Office, Washington 25, D. C. regarding National Bureau of Standards Handbook No. 81)

- ☐ HIGH TEMPERATURE TRANSFORMERS, a final report by the Raytheon Company on a study for the U. S. Navy which resulted in development of transformers operating with maximum "hot spot" temperatures of 350° and 600° C. Covers low voltage power, high voltage power, audio and pulse transformers, and new potting compounds, insulated magnet wires, flexible inorganic layer insulation and related developments. 221 Pages. (Report AD 256 785 available through military channels or at $15.50 in photocopy from OTS, U. S. Department of Commerce, Washington 25, D. C.)

- ☐ ATOMIC INDEMNITY MATTERS, a transcript of July 1961 hearings on indemnity provisions in the Atomic Energy Act, including discussion of possible risks in underground explosions. 180 Pages. Single Copies Free. (Write Joint Committee on Atomic Energy, F-88, The Capitol, Washington 25, D. C. regarding "Operations under Indemnity Provisions of the Atomic Energy Act.")

- ☐ COMMUNICATION SATELLITES, a fine collection of statements, testimony and exhibits relating to the many problems involved in planning for satellite communication networks. Two Volumes, 908 Pages. Single Copies Free. (Write Committee on Science and Astronautics, New House Office Building, Washington 25, D. C. for Hearings No. 19-Communications Satellites.)

- ☐ CLEARING AND PURIFYING AIR IN BUILDINGS, the Proceedings of a 1960 conference on air purification in various structures, from hospitals to space cabins, and a discussion of future research requirements. 59 Pages. $4. (Write Publications Office, National Academy of Sciences, Washington 25, D. C. for Publication No. 797)

- ☐ HIGH STRENGTH STEELS, a brief review of recent developments. 2 Pages. Single copies free to Government agencies, their contractors, subcontractors and suppliers. (Write Defense Metals Information Center, Battelle Memorial Institute, Columbus 1, Ohio regarding DMIC Memorandum No. 132)

- ☐ AIRSHIP AS AIRCRAFT MODEL TEST VEHICLE, a preliminary evaluation of Navy plans for the use of a ZS2G-1 airship as a flying test bed for model vertical take-off and landing (VTOL) aircraft -- in the same way standard wind tunnels are used. (Princeton Aeronautical Engineering Department Report No. 520, August 1960, available through military channels or at $2.60 in photocopy from OTS, U. S. Department of Commerce, Washington 25, D. C.)

- ☐ AUTOMOBILE EXHAUST GASES, a report on procedures for chemical analyses of certain oxygenated compounds, for sampling the exhaust gases for these analyses, and some results when these procedures were used. 35 Pages. Single Copies Free. (Write U. S. Bureau of Mines, 4800 Forbes Avenue, Pittsburgh 13, Pa. for Report of Investigation No. 5822)

- ☐ NONPROFIT ORGANIZATION R&D, a report on expenditures and manpower in the $218 million research and development effort of nonprofit groups during 1957. 58 Pages. 45 cents. (Write Government Printing Office, Superintendent of Documents, Washington 25, D. C. for Publication NSF 61-37)